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MYCOLOGIA

IN CONTINUATION OF THE JOURNAL OF MYCOLOGY

Founded by W. A. Kellerman, J. B. Ellis, and B. M. Everhart in 1885

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WILLIAM ALPHONSO MURRILL

Vol. III—JULY, 1911—No. 4

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PUBLISHED BIMONTHLY FOR
THE NEW YORK BOTANICAL GARDEN
By THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

CONTENTS

PAGE

Illustrations of Fungi—IX. WILLIAM A. MURRILL 165

Morphology of the Genus Cephalosporium with Description of a New Species and a Variety. R. E. BUCHANAN 170

Toxicological Experiments with Some of the Higher Fungi. ERNEST D. CLARK and JOHN L. KANTOR 175

The Agaricaceae of Tropical North America—III. WILLIAM A. MURRILL 189

Note on the Reputed Poisonous Properties of Coprinus comatus. LOUIS C. C. KRIEGER 200

News and Notes 203

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ILLUSTRATIONS OF FUNGI

MYCOLOGIA

VOL. III JULY, 1911 No. 4

ILLUSTRATIONS OF FUNGI—IX

WILLIAM A. MURRILL

The specimens here illustrated were collected and drawn during the summer of 1910. They are all represented natural size, and, being larger, will be found less difficult to identify than the small species figured in the May number of this journal.

In the printing of the accompanying plate, the red color, as frequently happens, came out too strongly, giving a purple tint to some of the figures. In figure 2, the pileus and gills should be fulvous; in figure 7, the pileus should be dark-fulvous with a chestnut tint.

Pholiota candicans (Bull.) Schröt.

Pholiota praecox (Pers.) Quél.

EARLY PHOLIOTA

PLATE 49. FIGURE 1. × 1

Pileus fleshy, convex to plane, at times umbonate, solitary or gregarious, 3–7 cm. broad; surface smooth or pitted, glabrous, moist, whitish, cream-colored or isabelline, the center often darker; lamellae adnexed, crowded, white, becoming fulvous; spores ellipsoid, smooth, ferruginous, 7–8 × 5 μ; stipe subconcolorous, equal, glabrous, 4–8 cm. long, 3–5 mm. thick; veil large, white, forming a conspicuous and permanent annulus near the apex of the stipe.

This is one of our best edible species, and it occurs quite abundantly during spring and summer in grassy and open places throughout temperate regions.

[MYCOLOGIA for May, 1911 (3: 97–164), was issued June 3, 1911.]

A very interesting sterile form of this species has appeared in abundance, both last year and this year, beneath a large white oak on the grounds of the New York Botanical Garden, a few fertile sporophores being present in each case and being similar in all respects to the sterile ones except as regards spore formation. The lamellae of the sterile plants remain pure-white and exceedingly thin; microscopic sections show the basidia undeveloped and devoid of sterigmata, the very few inflated cystidia being similar in form and abundance in both fertile and sterile sporophores. The sterility is absolute and without apparent cause.

Hebeloma praecox sp. nov.

EARLY HEBELOMA

PLATE 49. FIGURE 2. × 1

Pileus convex to expanded, slightly umbonate, gregarious, 4–5 cm. broad; surface dry, glabrous, opaque, smooth, ochraceous-isabelline; margin incurved, entire or undulate, showing no trace of a veil; context white, sweet, odor pleasant; lamellae sinuate, arcuate, close, many times inserted, pallid when young, fulvous at maturity; spores ovoid, smooth, pale-ochraceous, not conspicuously nucleate, 5–6 × 3–4 μ; stipe fleshy, brittle, subequal, stuffed to hollow, finely scabrous, sometimes rough, cremeous, 3–4 cm. long, 5–8 mm. thick.

Type collected among mosses on a shady bank in the New York Botanical Garden, June 20, 1910, by W. A. Murrill. Also collected again in the same spot, June 8, 1911. This is the first species of *Hebeloma* to appear in this locality. Although not at all viscid when found on either occasion, it might well become slightly so in wet weather. The remnants of the partial veil are left clinging to the stipe as the expansion of the pileus progresses, leaving none on the margin.

Coprinus sterquilinus (Fries) Quél.

LARGE-SPORED INKCAP

PLATE 49. FIGURE 3. × 1

Pileus ovoid to expanded, cespitose, 3–7 cm. broad; surface white and villose in young plants, becoming radiate-sulcate and blackish with age, the disk at all stages being brownish and squar-

rose-squamose; lamellae free, crowded, ventricose, white to black; spores very large, ellipsoid, regular, smooth, black, 18 × 12 μ in specimens found, reported slightly larger by most authors; stipe attenuate upward, fibrillose, white, blackening when handled, subbulbous at the base, 5–8 cm. high, 4–8 mm. thick; veil small, white, cottony, remaining near the base of the stipe as a small annulus.

This interesting species was described by Fries in 1821 from specimens collected on cow dung in autumn. My own plants, collected on a manure heap in the grounds of the New York Botanical Garden, June 22, 1910, were compared with those at Upsala and found to agree perfectly. Specimens found by Dr. Peck on the ground in an open field near Ticonderoga in August were described by him in 1879 as *Coprinus macrosporus*. Bolton's *A. oblectus* is probably the same thing, but it is hard to determine this with certainty. The species seems to be rare and not generally well known, either in this country or in Europe. Its edible qualities have probably not been tested, but some of our best economic species, figured in MYCOLOGIA for March, 1909, belong to this genus.

Melanoleuca melaleuca (Pers.) Pat.

Tricholoma melaleucum (Pers.) Quél.

BLACK AND WHITE MUSHROOM

PLATE 49. FIGURE 4. × 1

Pileus thin, convex to plane, depressed around the small umbo, solitary, 3–6 cm. broad; surface glabrous, fuliginous to fawn-colored, margin incurved when young; context thin, sweet, edible, inodorous; lamellae very white, ventricose, emarginate, crowded; spores ovoid-ellipsoid, finely echinulate, hyaline, uninucleate, 7–9 × 5–6 μ; stipe elastic, variable in color and size, subglabrous, slender, often enlarged above or below, 4–8 cm. long.

This well-known and exceedingly variable European species, occurring in open or slightly shaded grassy places, seems rare in America, and the form found about New York City appears so different from the normal European type as to be scarcely recognizable. To add further to the difficulty, this species is probably as much a *Collybia* as a *Tricholoma*, and *Collybia stridula* Fries seems hardly distinct from it. Dr. Peck has specimens from North Elba labeled *Tricholoma microcephalum* Karsten. His *T.*

melaleucum thujinum, from Warren Co., agrees best with our New York City form. *Tricholoma subcinereum* Peck is nearly allied, but is certainly distinct, having different spore characters.

Lactaria subdulcis (Pers.) Fries

SWEETISH LACTARIA

PLATE 49. FIGURE 5. × 1

Pileus fleshy, thin, convex, papillate, becoming depressed to infundibuliform, 1–5.5 cm. broad; surface fulvous, isabelline, or reddish-fulvous, not fading, azonate, dry, glabrous, smooth; margin involute, then spreading, sometimes flexuous: context firm, fragile, whitish or tinted with isabelline or fulvous, odorless, edible; latex white, unchanging, mild or slowly acrid to bitterish; lamellae whitish or tinted with isabelline, becoming pruinose, sometimes forking, close, adnate, or decurrent by a tooth, up to 3 mm. broad; stipe of the same color as the pileus or paler, nearly equal or tapering upwards, glabrous, or sometimes slightly pubescent at the base, dry, stuffed, becoming hollow, 2–7 cm. long, 2–6 mm. thick: spores white, globular to broadly ellipsoid, echinulate, $7 \times 8\,\mu$.

This edible species occurs on the ground in or near woods throughout the eastern United States and Europe. The above description is taken from Miss Burlingham's monograph of the genus *Lactaria,* published in volume 9, part 3, of NORTH AMERICAN FLORA.

Lepiota americana Peck

AMERICAN LEPIOTA. BLUSHING LEPIOTA

PLATE 49. FIGURE 6. × 1

Pileus ovoid to convex and at length expanded, umbonate, 5–15 cm. broad; surface white, umbo and scales reddish-brown, the entire plant becoming reddish-brown when wounded or on drying; lamellae white, free, close; spores subellipsoid, smooth, hyaline, uninucleate, $7.5–10 \times 5–7\,\mu$; stipe thickened below, white, hollow, 7–12 cm. long; veil white, forming an apical annulus.

A conspicuous and easily recognized edible species of wide distribution in America, occurring in groups or clusters on rich lawns or about old stumps, sawdust piles, or compost heaps from midsummer to autumn. *Lepiota Morgani,* a poisonous species resembling it in shape, has green spores, causing the gills to assume a green color as they mature.

Collybidium luxurians (Peck) Murrill

LUXURIANT COLLYBIDIUM

PLATE 49. FIGURE 7. × 1

Pileus convex to expanded, umbonate, cespitose, 5–8 cm. broad; surface dry, faintly radiate-striate but not fibrillose, fulvous, with bay umbo, irregular with undulate margin; context somewhat tough but easily torn, odor pleasant, taste sweetish; lamellae sinuate, arcuate, rather close, narrow, crenulate, pallid, becoming discolored; spores oblong-ellipsoid, smooth, hyaline, 7–8 × 3–4 μ; stipe twisted, curved, slightly enlarged below, hollow, cartilaginous, pruinose, pallid above, tinged with fulvous below, 10–12 cm. long, 5–9 mm. thick.

This species was first described as a *Collybia* by Dr. Peck in 1897 from dried specimens sent him by Dr. Underwood, who collected them under brush heaps near Auburn, Alabama, in July, 1896. The accompanying illustration and description were drawn from plants collected by Mr. Volkert and myself in weeds at the edge of a sawdust pile near Bronx Park, June 20, 1910. They were found to agree with the type specimens at Albany in all important characters, but are only about one half as large.

MORPHOLOGY OF THE GENUS CEPHALOSPORIUM,

WITH DESCRIPTION OF A NEW SPECIES AND A VARIETY

R. E. Buchanan

(With Plates 50 and 51, Containing 9 Figures)

Certain species of the hyphomycetous genus *Cephalosporium* have been found to be of common occurrence in the humus-rich, prairie soils of Iowa. The morphology and relationships of this genus have not been well understood; it is therefore believed of interest to publish the results of a study of one of these species and a variety.

The genus *Cephalosporium* Corda is characterized by its well-developed hyaline mycelium and its slender, unbranched conidiophores which abstrict non-septate spores from the tip, these latter being pushed to one side by the later spores and all remaining as a head, stuck together by mucus. The genus *Hyalopus* Corda is differentiated from *Cephalosporium* by the abundant production of mucus, and the resultant globular refractive head produced. The distinction is made solely on the relative amount of mucus. *Allantospora* Wakk has been separated from *Hyalopus* on account of its allantoid, sometimes 1–2 septate, conidia. One species of *Allantospora* has been described, *A. radicicola* Wakk, upon the roots of *Saccharum officinarum*. Its obvious relationship to *Cephalosporium* has caused Saccardo (Sylloge **14**: 1043) to include it among the Amerosporae of the Mucedinaceae, while Clements in his "Genera of Fungi" has placed it under the Phragmosporae (Hyalophragmiae), doubtless because of the occurrence of septate spores. Lindau (Rabenhorst's Krypt. Flora **8**: 100–101) has expressed the opinion that the genera *Hyalopus* and *Cephalosporium* should be united. Under the heading of "*Hyalopus populi* Nypels" he says: "Bei kulten in feuchten Luft entsteht

das durch Schleim zusammengeballte kuglige Konidienköpfchen. Dagegen zeigen die Konidienträger in trockner Luft nur einzelne Konidien welcher locker zu Köpfchen zusammentreten. In letzteren Falle zeigt sich gegen *Cephalosporium* nicht der geringste Unterschied, so dass ich der Meinung sei möchte, *Hyalopus* ist nur ein unter feuchten Verhältnissen wachsendes *Cephalosporium*. Weitere Beobachtungen über die Bildung der Konidienköpfchen wären sehr erwünscht."

The species and variety of *Cephalosporium* here described were isolated from humus-rich soil on dextrose agar made up without intentional addition of combined nitrogen in any form. The colonies develop quickly on a variety of media, peptone agar and gelatin, mannite and dextrose N free agar, mannite dextrose and starch N free solutions, peptone solution, peptone and dextrose gelatin and solidified blood serum. The rapidity, type and luxuriance of growth exhibit some differences on the various media employed.

The mycelium is in all cases hyaline, at least when young, septate and much branched. The sterile hyphae are of indeterminate length. On dextrose agar plate cultures they grow from center to circumference of the Petri dish in the course of four days to a week at 20° C. The diameter of the hyphae varies from 5 to 25μ. The cell contents, at first homogeneous, become somewhat vacuolate and later hold a large number of oil drops. There is little evidence of negative chemotropism of the hyphae toward each other, as they cross and recross repeatedly. The hyphae penetrate the medium to a depth of half an inch in agar tubes. The organism grows well only in the presence of an abundance of oxygen. Aerial hyphae are not thrown off in abundance from the surface of a plate culture, but whenever the organism comes in contact with a foreign substance as the glass wall they are sent up in abundance. Some of these may reach a length of half an inch or more.

The conidiophores are developed abundantly on all hyphae that lie at the surface of the medium and upon the aerial hyphae when formed. A few develop even below the surface of the medium. They are slender, hyaline, and vary in length from a micron or two to twenty or thirty on some aerial hyphae and 10 to 50μ on a moist surface or in a moist atmosphere. They are usually non-

septate. They show little evidence of the negative hydrotropism so characteristic of many of our common molds, such as *Penicillium* and *Aspergillus*. Those developing from hyphae lying in contact with the medium are usually bound down by the water film and develop along its surface.

The spores are formed by the abstriction of the tip of the sporophore. Each is enveloped in mucus, the amount depending upon the moisture of the atmosphere in which it develops. In a dry atmosphere only sufficient is found to cause the spores to stick together in a head. In a moist atmosphere the globule of mucus swells until it completely envelops the spores, and careful observation will show them floating free in the liquid, which sometimes has three to four times the mass of the spores. That this is not merely water but mucus, is demonstrated by the preparation of a mount in alcohol, where the heads remain intact, because the mucus does not dissolve. When water is added, however, the spores are freed by the solution of the mucus and separate. Lindau's characterization of *Hyalopus* as a *Cephalosporium* grown in a moist atmosphere is justified. The heads vary in size from 10 to 35 μ and contain from two to numerous spores. The spores are ovoid to cylindric with rounded ends, usually with granules. When the sporophores are short, the spore masses are found upon the surface of the hyphae. The sporophore sometimes produces a head of spores, then, because of some undetermined stimulus, it resumes growth and produces a new head. This may occur several times and results in masses of spores at intervals along the sporophores. The spores developed on the moist surface of the medium are usually larger than those of the aerial conidiophores. When formed they frequently continue to enlarge after separation from the hyphae and become considerably elongated, even crescent-shaped, and falcate. When grown to several times their original length they become septate, from one to six or eight septa being formed. These spores then bud at one or more points and develop new conidia of a similar size and shape. In this manner large masses of sickle-shaped or allantoid, septate conidia are produced. They remain attached to each other by slender threads. Many of these spore masses in the older portion of the culture are distinctly visible to the naked eye. Rarely they reach a diameter of several millimeters. In some cases the spore mass has a

greenish tinge. In an atmosphere sufficiently moist some of the erect conidiophores are found to be capped by these long septate spores rather than by the more usual short, non-septate type. Every gradation in shape, size and septation may be observed in a single mount from some cultures. These latter allantoid, septate spores imbedded in mucus answer to the diagnosis of *Allantospora*. The spores of all types germinate readily. Germ tubes may issue from several of the cells of a septate spore. The spores borne on aerial conidiophores and forming heads of the *Cephalosporium* type are from 4–15μ in length and one half to one third as broad. Those that develop in a moist atmosphere and form heads of the *Hyalopus* type vary from 5 to 15μ and are one fourth to one half as broad as long. When developed on the surface of the medium in the presence of an excess of moisture, they either resemble the preceding or become allantoid or falcate, 20–30 $\times$ 3–5 μ.

From the foregoing description it seems evident that the genus *Hyalopus* should be merged with *Cephalosporium* as suggested by Lindau. It is also possible that *Allantospora* is but a growth form of *Cephalosporium*.

The variety *purpurascens* described below differs in no marked particular from the type except for the production of a purple pigment. This pigment production is somewhat inconstant, and is usually slow in making its appearance. In some cases the purple coloring matter is diffused into the dextrose agar in such quantities as to make it practically opaque and of a rich wine-red color. The pigment permeates the mycelium and is found in some of the spores.

It is possible that the following species has been observed and described in one of its growth forms, but none of the published diagnoses are sufficiently complete to allow of satisfactory identification.

It is a pleasure to acknowledge the author's indebtedness to Dr. L. H. Pammel for his many courtesies and valuable assistance.

Cephalosporium Pammelii sp. nov.

Hyphis sterilibus decumbentibus vel raris in aere crescentibus, longis, hyalinis, multis ramosis, vacuolatis denique protoplasmate cum oleis globulis repreto, articulatis, 5–15 μ crassis; chlamydo-

sporis 5–10 × 10–15 μ conidiophoris e mycelio lateraliter nascentibus, erectis vel decumbentibus, simplicibus vel raris ramosis, non vel raris septatis, 2–20 × 3–5 μ in aere sicco, 5–50 × 3–8 μ in aere humido, non hydrotropismis, summo capitulo globoso 10–35 μ diam.; conidiis in aere humido muco-glomeratis, in aere sicco separatis vel laxe cohaerentibus, ellipsoideis vel ovoideis et continuis, vel in aqua falcatis, allantoideis et 1–8 septatis, hyalinis, granulosis.

Hab. in dextrose agar pulvene terrae humosae infecta.

Var. *purpurascens*. Hyphis sterilibus primo hyalinis, albis, denique roseis vel purpureis; conidiis hyalini vel purpurascentibus, pigmento purpureo in alcohol et aqua soluto, in dextrose-agar et alteris mediis saccharis diffuso.

Hab. in dextrose agar pulvere terrae humosae infecta.

BACTERIOLOGICAL LABORATORIES,
IOWA STATE COLLEGE,
AMES, IOWA.

EXPLANATION OF PLATE 50

Cephalosporium Pammelii Buchanan

1. Microphotograph of type. Mycelium, sporophores and spores on the surface of dextrose agar plate. Courtesy of Iowa Agricultural Experiment Station.

2. Microphotograph of type. Masses of falcate and allantoid, septate spores. Surface of dextrose agar plate. Courtesy of Iowa Agricultural Experiment Station.

EXPLANATION OF PLATE 51

Cephalosporium Pammelii and var. *purpurascens*

1. Aerial conidiophores developing in relatively dry air. *1a*. Medium moist air, therefore somewhat moist, mucus globule not evident. *1b*. var. *purpurascens*. Conidiophores in dry air after medium has dried. *1c*. var. *purpurascens*.

2. Conidiophores which have grown in length intermittently, with clusters of spores. *2a*. var. *purpurascens* developed in relatively dry air. *2b*. Type developed in moist air with mucus globules.

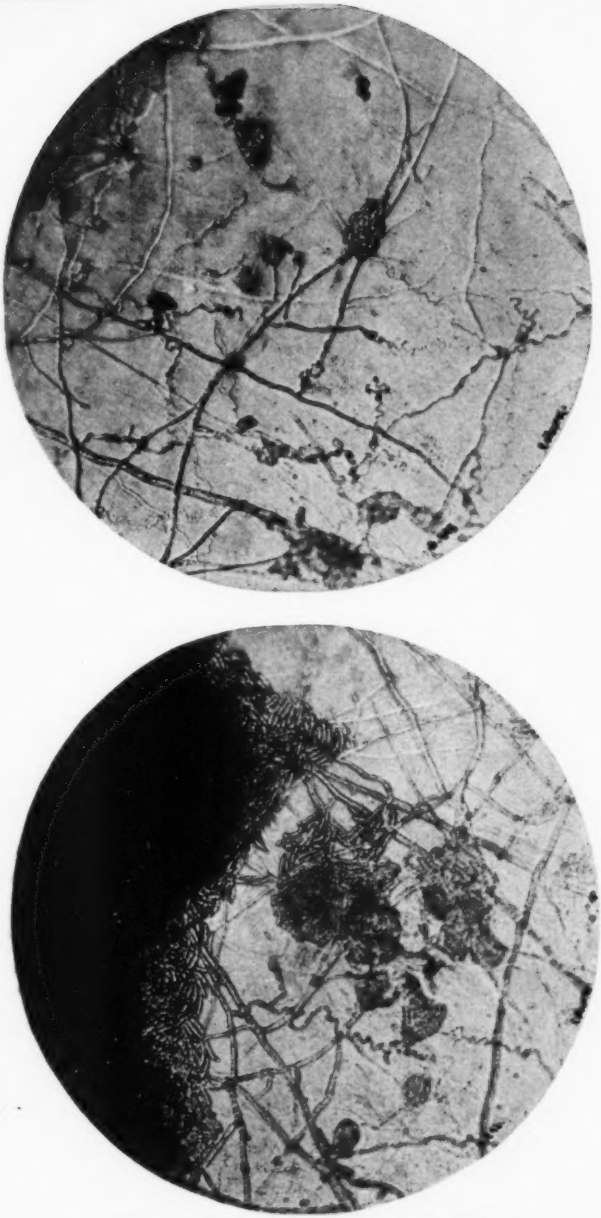
3. Aerial conidiophores of type, developed in moist air, showing the *Hyalopus* type of head.

4. Conidiophores of type produced in contact with the surface of moist agar. *4a, b, c, d*. Illustrating the variety of spore shapes and sizes, and the evident continued growth of the spore after abstraction.

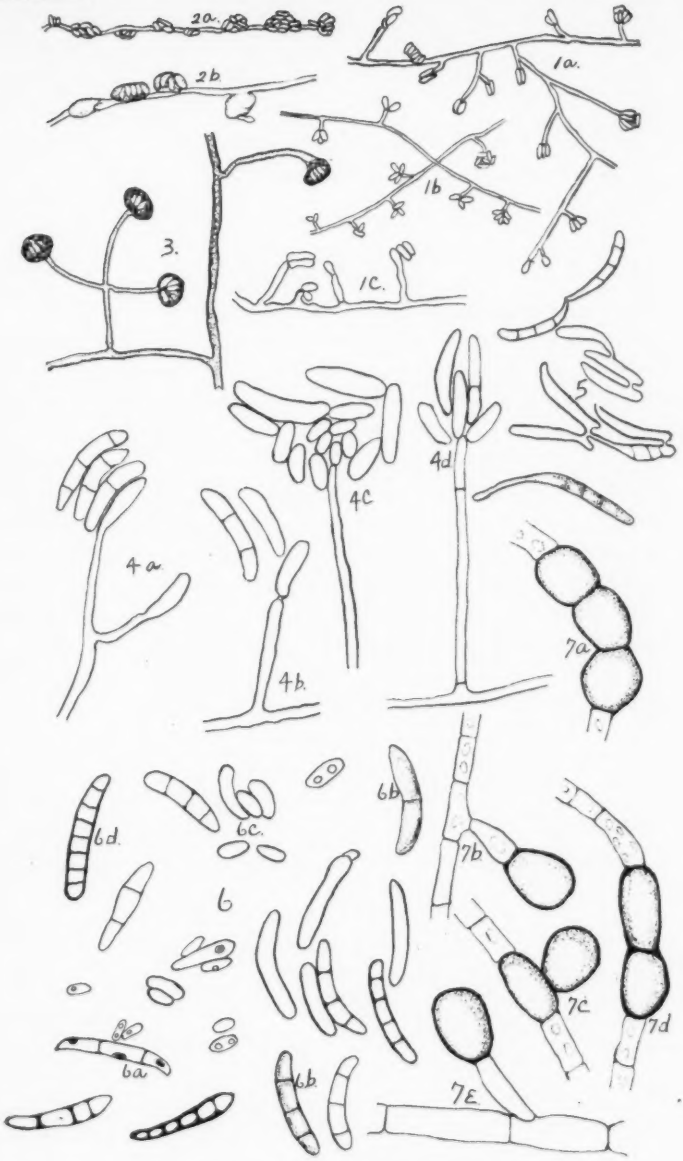
5. Falcate spores from a large spore mass, illustrating the method of budding and continued growth.

6. Spores from the surface of agar, showing the unicellular and multiseptate forms. *6a*. Septate spore from preparation stained with fuchsin to show the nuclei. *6b*. Septate spores of var. *purpurascens* with purple pigment.

7. Chlamydospores of the type, from dextrose N free agar. *7a, b, c, d, e*, showing development of spores, intercalary or terminal.



CEPHALOSPORIUM PAMMELII BUCHANAN



CEPHALOSPORIUM PAMMELII BUCHANAN

TOXICOLOGICAL EXPERIMENTS WITH SOME OF THE HIGHER FUNGI

ERNEST D. CLARK AND JOHN L. KANTOR

INTRODUCTION

From the earliest times it has been observed that the consumption of certain species of mushrooms is followed by extremely unpleasant and occasionally fatal results. *Amanita muscaria* and *Amanita phalloides*, among others, have earned a very unsavory reputation by their ever growing list of fatalities. The danger from these plants is so great that usually only novices are unaware of their appearance and properties. Consequently, their death-roll receives its greatest additions from among foreigners and children. However, cases of mistaken identity have occurred even in the baskets of experienced persons. Among the species of *Amanita* we find many of the most poisonous forms, but other groups have dangerous representatives as well, although none quite so fatal.

The evil reputation of *Amanita muscaria* induced Schmiedeberg and Koppe* to investigate its poison from chemical and pharmacological standpoints. From their careful work it became evident that this plant contained an active principle which they called muscarin. This was at first considered an alkaloid of the general nature of strychnin and morphin, but later work has shown that it is probably a complex ammonia derivative. Muscarin is an extremely active substance and although present in the fungus in small amounts, it is still able to show its characteristic and fatal effects. Muscarin is particularly violent in its action on the nervous system, causing increased secretion, rapid pulse, then paralysis and finally cessation of heart action by stimulating the inhibitory nerve-endings of that organ. All of these effects may be neutralized by the administration of atropin in small doses; the latter being a complete antidote for pure muscarin. Unfortunately,

* Schmiedeberg and Koppe: Das Muskarin. Leipzig, 1869.

however, atropin cannot wholly prevent the harmful effects caused by eating *Amanita muscaria,* possibly because there are other toxic substances present in the plant. Harmsen† held this opinion as a result of his study of this fungus. He found that atropin was not a complete antidote for extracts of *Amanita muscaria,* and furthermore, that weight for weight his preparations from the fresh plant were twice as toxic as pure muscarin. From his experiments upon cats and dogs he calculated that if muscarin *alone* were responsible for the toxic effects of this plant, it would be necessary for a man of average weight to eat *four kilograms* of the fresh fungus in order to receive the lethal dose of pure muscarin. Therefore he postulated the existence of another poison in *Amanita muscaria,* calling it "Pilz-toxin." He claimed that this substance, when separated from muscarin in extracts of the fungus, was not neutralized by atropin, and produced long-continued convulsions and ultimate death. The work of Harmsen upon his "Pilz-toxin" has never been confirmed, but most of the evidence, clinical and otherwise, indicates that muscarin may not be the sole factor involved in cases of poisoning by *Amanita muscaria.* Ford* has also shown that in this species there are present peculiar substances that first cause an agglutination and finally a solution of the red corpuscles of the blood. However, muscarin is probably the toxic substance of greatest importance in *Amanita muscaria* because it withstands heating, whereas the associated materials which affect the blood as above stated, are destroyed by heat, and thus are prevented from acting after the ingestion of the cooked fungi.

Amanita phalloides is even more dangerous than *Amanita muscaria* because there is no known antidote for its poisonous principle. Several investigators have studied the poisons of this plant, but Ford† alone seems to have been able to isolate and learn the properties of its poisonous substances. The results of poisoning

† Harmsen: Zur Toxicologie des Fliegenschwammes. Archiv. f. Expt. Path. u. Pharmacologie. 1906, 1, p. 361.

* Ford: Distribution of poisons in the Amanitas. Jour. Pharmacol. and Expt. Therapeutics. 1909, i, p. 275.

† Ford: Distribution of haemolysins, agglutinins and poisons in fungi, especially the Amanitas, Entolomas, Lactarius and the Inocybes. Jour. Pharmacol. and Expt. Therapeutics. 1911, ii, p. 285. This paper has a complete bibliography.

by *Amanita phalloides* are distinct from those seen in the case of *Amanita muscaria,* since the latter apparently causes death by its action upon the nervous system. These effects are more serious than any caused by the blood-destroying substances found in so many mushrooms. Fortunately, however, the latter are not so important, owing to the ease with which they are destroyed by heat and the digestive juices. Autopsies after fatal *Amanita phalloides* poisoning of people and animals show that most of the internal organs are congested, hemorrhagic, and very seriously affected with necrosis and degeneration. In serious cases death intervenes in a few days, while muscarin poisoning develops in a few hours and runs rapidly to death or complete recovery in a short time. There is no antidote for poisoning by the so-called "amanita-toxin" of *Amanita phalloides,* nor is a rapid recovery to be expected, in view of the grave lesions it causes. As in the case of muscarin, the "amanita-toxin" is not destroyed by cooking. The blood-laking poisons of this same fungus are destroyed by heat and so probably they are always without effect unless the fungus is eaten in the raw state. Schlesinger and Ford* purified the "amanita-toxin" by rigorous chemical methods and obtained final products showing all the characteristic effects of the plant extracts which had been heated to destroy blood-laking substances. They found that the "amanita-toxin" did not seem to belong to the ordinary classes of the powerful poisons, such as the toxalbumins, alkaloids, etc.

Very recently Ford† has reported that in *Inocybe infelix* he found a peculiar poison that resisted heat and drying. In animals it did not produce the effects of muscarin, "amanita-toxin," or of any known mushroom poison. The symptoms came on at once and by their nature seemed to indicate the action of some powerful narcotic poison upon the nervous system. The most striking symptoms were extreme drowsiness, forcible retraction of the head (in rabbits), and complete paralysis lasting several hours. The smaller animals died but the larger ones recovered completely in a few hours. All of these observations seemed to indi-

* Schlesinger and Ford: On the chemical properties of Amanita-toxin. Jour. Biol. Chem., 1907, iii, p. 279.

† Ford: see footnote, page 176.

cate an active narcotic poison of a somewhat unique character. The fact that this *Inocybe* is very closely related to *Inocybe infida* makes Ford's observations very interesting in connection with our own upon this plant, as stated below.

A CASE OF POISONING BY INOCYBE INFIDA

The details of the poisoning by *Inocybe infida* of Dr. W. C. Deming and his family in this vicinity have already been published,* but they will be repeated here for the sake of completeness. We quote from Dr. Deming's own notes made at the time:

"I here transcribe notes made on that or the following evening: June 14, '09, about 11:30 A.M., my son and I gathered about a quart of mushrooms, mostly of the unknown variety and some of

Fig. 1. *Inocybe infida* (Peck) Earle.

the variety frequently eaten. No other kind was gathered. These were stewed and served on toast at 1 P.M. I ate only one half slice with the mushroom thereon, some bread and butter, two cups of weak tea, a little more than one half a stuffed egg, with lettuce and mayonnaise dressing.

"Directly after lunch I smoked one half a cigarette as usual. On finishing this, I began to wonder if this or the mushroom had

* Murrill: A New Poisonous Mushroom. Mycologia, 1909, i, p. 211.

disagreed with me, on account of a slight 'queer' feeling which I cannot accurately describe, but it was so little at first that I dismissed it from my mind. In a few minutes, however, I gradually began to get a fullness in the head and a rapid heart action as if I had taken nitroglycerin. Then I began to sweat, with a feeling of heat over the body, so that my clothing was drenched, even my outer clothing requiring changing later. At the same time there was no nausea nor prostration nor other bad feeling, and I attended to a man with a wound in my office and then to other members of the family without difficulty, though a little confused in mind perhaps. A little after that, perhaps forty-five minutes after eating the mushroom, I washed out my stomach with a tube, and later took about an ounce of castor oil. Soon after, but long before the oil operated, I had a disagreeable sense of pressure, almost pain in the lower bowel, accompanied for a little while by slight abdominal soreness or pain. All symptoms gradually subsided and by evening I was as well as ever except for a little feeling of exhaustion.

"My wife, 25 years old, ate one whole slice of toast with mushrooms, two half eggs stuffed with lettuce and mayonnaise, tea, bread and butter. About half an hour later she felt nauseated and dizzy and lay down. I gave her five glasses of warm water, after which she vomited the egg, but saw no mushrooms. She then took castor oil.

"Mrs. A., 65 years old, ate the same amount of mushrooms, several slices of bread and butter, a cup of tea, but no eggs nor salad. When asked, said she felt slight indigestion, but otherwise well.

"My son, 5 years old, ate same amount, but no eggs nor salad. Immediately after lunch he had a diarrheal movement containing mushrooms. He was given ipecac and warm water and vomited some mushrooms.

"Sophie, maid, aged 30, tasted mushrooms. Felt nauseated soon after. Given mustard and water, but did not vomit. Later, castor oil and was purged and somewhat prostrated. Hattie, maid, aged 38, tasted mushrooms. Belched gas soon after. Not sick. Esther, maid, aged 24, tasted; no effects.

"There was no peculiar taste to the cooked mushrooms, perhaps

a very evanescent bitterness in the raw state. I thought perhaps the combination of the eggs and mayonnaise with the mushrooms had something to do with the effects, as my wife and I, the only ones who ate both in any amount, were the chief sufferers. In my case the beating of the heart, full head and sweating were very marked, though I ate but half as much as the others."

In this case we are fortunate in having a physician's careful description of the symptoms following the meal of harmful mushrooms. It should be noted that these symptoms were caused by the cooked fungi. That fact, taken with the nature of the symptoms, rapidity of recovery, etc., would indicate a toxic substance having more the nature of muscarin than that of blood-laking substances or of the "amanita-toxin," which, under analogous conditions, acts slowly.

EXPERIMENTAL

THE CHEMICAL METHODS OF THE INVESTIGATION

The general features of the clinical data in this case of poisoning seemed to indicate the action of an alkaloid. In some preliminary experiments it was found that the toxic principle could be extracted by hot or cold 95 per cent. alcohol, and that the evaporation residue from such toxic extracts, after being dissolved in water, yielded a slight yellowish precipitate with potassio-mercuric iodide (Mayer's reagent). We then applied to the available specimens of *Inocybe infida* the method of Harmsen* for the preparation of muscarin from *Amanita muscaria*. The air-dry plants of *Inocybe infida* are very small, those of average size usually weighing from 0.1 gram to 0.3 gram. The dry plants were powdered in a coffee-mill and treated as follows:

The powder was extracted twice for twenty-four hour periods with ten times its weight of 95 per cent. alcohol. The extraction was carried out at room-temperature with an occasional thorough shaking. The alcoholic solutions were evaporated to the consistency of a thick syrup on a water-bath. The syrup was extracted with a small volume (15–25 c.c.) of 95 per cent. alcohol. This extract was also evaporated to the consistency of a syrup,

* Harmsen: see footnote, page 176. Slight modifications of the method were introduced.

which, in turn, was thoroughly triturated with powdered glass until a stiff paste was formed. This paste was spread thinly on large watch-glasses and kept in a vacuum desiccator over sulphuric acid for a week. The desiccator was frequently exhausted.

The resultant dry friable mass was then extracted with three successive small portions of absolute alcohol. These solutions were combined, evaporated to dryness on a water-bath, treated with a small volume of water and filtered free from the large amount of fatty matter which separated out. The filtrate was usually clear and colorless, and neutral or slightly alkaline to litmus. When 40 grams of material were used, the volume of the final aqueous solution was about ten cubic centimeters. By evaporation, this volume of solution yielded from 0.05–0.15 gram of a semi-crystalline residue.

The modified method just outlined was adopted after several other variations of it had been tried. For instance, Harmsen used boiling alcohol to extract his material, but in our hands it was not as satisfactory as the cold alcohol, because the hot solvent dissolved a larger amount of gummy matter, and besides, such residues showed no greater toxicity than those obtained by extraction with cold alcohol. The success of this extraction method depends upon the repeated purifications that result from re-solution of the syrupy evaporation residues with fresh alcohol, and also upon the complete drying of the powdered-glass-syrup mixture in the desiccator. When the residue from the absolute alcohol extract was treated with water, a bulky insoluble portion was separated. The small amount of aqueous filtrate was used for injection into frogs.

The fact already mentioned, that potassio-mercuric iodide precipitated yellowish material when added to the *Inocybe* extract, led to the use of this reagent for the purification of the toxic substance. The method of alkaloid purification, as finally adopted, was that recommended by Dragendorff,* which was conducted as follows:

The aqueous filtrate obtained in the last phase of the Harmsen

* Dragendorff: Plant Analysis, translated by Greenish. London, 1884, pp. 57–8.

process was made slightly acid with sulphuric acid, and then treated with a moderate excess of potassio-mercuric iodide solution. A yellowish amorphous precipitate formed at once, and after heating the mixture for an hour on a water-bath, the precipitate was allowed to settle over night. Filtration through double filters was often necessary to remove the colloidal precipitate. The thoroughly washed precipitate was then suspended in hot water and decomposed with hydrogen sulphide, while the mixture was still hot. After this treatment the mercury sulphide could be filtered off readily, especially if the mixture was first allowed to stand on a steam-bath for an hour or more. The filtrate contained some free hydriodic acid and also the compound of the toxic substance with hydriodic acid. The *careful* addition of silver sulphate, in the form of a saturated aqueous solution of that substance, until no further precipitate was obtained, followed by boiling for a short time, served to decompose and precipitate all iodine derivatives. The yellow silver iodide was then filtered off and the sulphuric acid in the filtrate removed by precipitation with an excess of barium carbonate. The clear filtrate, from the resultant barium sulphate plus the physical excess of barium carbonate, contained any alkaloidal substance that occurred in the specimens under examination. We evaporated this aqueous solution to 10–15 c.c. on a water-bath and used small portions of it in the pharmacological tests on frogs as indicated below.

Thinking that cholin, resulting from the decomposition of lecithins in the fungi, might be present with the toxic substance in the final filtrates, we tested all of the latter for cholin. Rosenheim's* periodide test offers a beautiful and characteristic means of detecting cholin. Practically all the extracts were found to contain it. For the detection of cholin one adds a drop of platinum chloride solution to the liquid to be tested, which may be only a few drops on a microscope slide. After allowing the water to evaporate, the feathery and prismatic colorless crystals of the cholin-platinum chloride and of the excess of platinum chloride may be easily detected under the microscope. When these crystals

* Rosenheim: New Tests for Choline in Physiological Fluids. Jour. of Physiol. 1905, xxxiii, pp. 220–4.

are treated with a drop or two of Lugol's solution,* the microscopical appearance gradually changes; the original crystals slowly disappear, the whole field becomes darker, and finally characteristic brown platelets come to view in large numbers. The cholin periodide crystals have a great similarity to the "haemin" crystals obtained in Teichmann's test for hemoglobin. Upon evaporation of the water, the crystalline plates lose their form and change into oily drops, which immediately resume their characteristic form when more Lugol's solution is added.

Before applying the extraction and alkaloidal separation methods to *Inocybe* we tested them upon samples of *Amanita muscaria* to determine the efficacy of our procedures. The methods were found to be satisfactory.

TOXICOLOGICAL EXPERIMENTS

In our experiments to determine the toxicity of extracts upon frogs we used lively animals weighing from 25 to 40 grams. All injections were made into the dorsal lymph-sac except in a few cases, when the toxic solution was given by mouth through a small narrow pipette. A description of these experiments follows.

EXPERIMENTS WITH AMANITA MUSCARIA. Twenty-five grams of air-dry specimens were treated and extracted as already described, but no attempt was made to apply the alkaloidal separation process. The final volume of the aqueous solution was 15 c.c., which on evaporation to dryness yielded 0.18 gram of a waxy, semicrystaline residue. This residue gave a striking Rosenheim cholin test.

Experiment 1. July 14, 1910. Frog 2. Weight, 27 grams. Received an injection of 1 c.c. of *Amanita muscaria* extract at 2.36 P.M.

2.38 P.M. Paralyzed after excitement.

2.41 P.M. Paralyzed, very slight muscular reflexes.

2.47 P.M. Heart stopped in diastole.

Experiment 2. July 14, 1910. Frog 3. Weight, 31 grams. At 9.58 A.M. received an injection of 0.5 c.c. of the extract administered to the frog in Experiment 1.

* Lugol: Lugol's solution contains 4 grams of iodine and 6 grams of potassium iodide dissolved in 100 c.c. of water.

10.02 A.M. Paralyzed.

10.15 A.M. Apparently recovered.

10.20 A.M. Paralyzed again.

10.27 A.M. Heart stopped in diastole.

The remainder of the available air-dry specimens (20 grams) was extracted according to Harmsen's scheme and the residue thus obtained was subjected to the alkaloidal separation process already outlined. A small amount of a waxy residue was the outcome of this treatment. This residue weighed 0.07 gram. It was dissolved in 10 c.c. of water. This solution also responded to the test for cholin.

Experiment 3. August 11, 1910. Frog 11. Weight, 29 grams. Received an injection of 1 c.c. of extract at 4.27 P.M.

4.31 P.M. Completely paralyzed.

4.35 P.M. Heart stopped.

EXPERIMENTS WITH INOCYBE INFIDA. FIRST GROUP. Twenty grams of pulverized *Inocybe infida* were extracted in the usual way and the final residue, weighing 0.21 gram, was dissolved in 10 c.c. of water. The residue was greenish and semi-crystalline. Its solution was slightly alkaline to litmus. This extract was not subjected to the alkaloidal separation process.

Experiment 4. July 15, 1910. Frog 8. Weight, 35 grams. Received an injection of 1 c.c. of *Inocybe* extract at 2.30 P.M.

2.37 P.M. Lethargic. Swallowing motions.

2.55 P.M. Lethargic. Swallowing motions. Began to appear bloated. July 16, 10.30 A.M. Heart stopped. Animal bloated.

Experiment 5. July 15, 1910. Frog 9. Weight, 26 grams. At 3.56 P.M. received an injection of 2 c.c. of the extract administered to the frog in Experiment 4.

4.01 P.M. Nearly paralyzed.

4.17 P.M. Wholly paralyzed.

4.21 P.M. Heart stopped.

Forty grams of pulverized *Inocybe infida* were extracted and treated in the usual manner. The residue, which was waxy and greenish in color, weighed 0.36 gram. It was dissolved in 20 c.c. of water. This solution contained cholin, as was indicated by the periodide test. The alkaloidal separation process was not applied to it.

Experiment 6. July 26, 1910. Frog 10. Weight, 31 grams. Received an injection of 1 c.c. of this extract at 2.55 P.M.

3.15 P.M. Lethargic.

5.30 P.M. Partly paralyzed.

July 27, 9.30 A.M. Apparently normal.

Experiment 7. July 28, 1910. Frog 10a. Weight, 28 grams. At 2.06 P.M. received an injection of 1.5 c.c. of the extract administered to the frog in Experiment 6.

2.12 P.M. Partly paralyzed.

3.30 P.M. Wholly paralyzed.

July 29, 9.20 A.M. Apparently normal.

Experiments 6 and 7 were repeated in every particular, with a new extract. The final residue weighed 0.43 gram. It was dissolved in 20 c.c. of water. The test for cholin was positive.

Experiment 8. January 20, 1911. Frog 16. Weight, 33 grams. Received an injection of 1 c.c. of this extract at 3.12 P.M.

3.16 P.M. Excited.

3.23 P.M. Very lethargic, partly paralyzed.

3.30 P.M. Wholly paralyzed.

4.00 P.M. Recovering. Bloated. Partly paralyzed.

4.30 P.M. Slightly paralyzed.

January 21, 9.10 A.M. Lethargic(?), bloated.

4.00 P.M. Normal, bloated(?).

Experiment 9. January 19, 1911. Frog 17. Weight, 37 grams. At 4.07 P.M. received an injection of 1 c.c. of the extract administered to the frog in Experiment 8.

4.13 P.M. Excited.

4.25 P.M. Very lethargic.

4.40 P.M. Lethargic and partly paralyzed.

January 20, 9.00 A.M. Lethargic and bloated.

January 21, 9.15 A.M. Normal.

SECOND GROUP. The evaporated remainders of the *Inocybe* extracts prepared for use in Experiments 4–9 were combined, redissolved, and the alkaloidal separation process applied to the resulting solution. The precipitate given with potassio-mercuric iodide was light in color and in such a finely divided state that it was filtered off with difficulty. The precipitate was not as yellow as that from *Amanita muscaria,* nor was it as crystalline in ap-

pearance. The final residue was greenish and weighed 0.13 gram The test for cholin was positive. The solution was neutral to litmus.

Experiment 10. February 13, 1911. Frog 18. Weight, 24 grams. Received an injection of 1 c.c. at 2.07 P.M.

2.25 P.M. Excited.

2.32 P.M. Partly paralyzed.

2.35 P.M. Completely paralyzed.

4.30 P.M. Lethargic and partly paralyzed.

February 14, 9.15 A.M. Apparently normal.

EXPERIMENTS WITH CLITOCYBE MULTICEPS. Having already studied the action of extracts of the poisonous *Amanita muscaria* and the questionable *Inocybe infida,* we performed similar experiments with comparable extracts of *Clitocybe multiceps,* which is known to be harmless. This plan was intended to serve as a "control" of our previous procedure and to show whether we had introduced poisonous material into our extracts during their preparation. About 50 grams of dried *Clitocybe multiceps* were treated in the usual manner and finally 0.23 gram of a waxy residue was obtained. This residue was dissolved in 10 c.c. of water. The solution seemed to be slightly alkaline to litmus. The test for cholin was very pronounced, in fact, it was the most striking of any yet observed by us in this study.

Experiment 11. October 14, 1910. Frog 13. Weight, 35 grams. Received an injection of 1 c.c. of the extract at 9.47 A.M.

10 A.M. No symptoms.

12 M. Normal and continued so.

Experiment 12. October 14, 1910. Frog 14. Weight, 25 grams. At 10.50 A.M. received an injection of 2 c.c. of the extract administered to the frog in Experiment 11.

11.25 A.M. No symptoms.

12.00 M. Slightly lethargic(?).

12.45 P.M. Normal.

October 15, 9.10 A.M. Normal and continued so.

The remainder of the extract prepared for use in Experiments 11 and 12 was treated according to Dragendorff's method for the separation of alkaloids. The resultant residue weighed 0.05 gram. It was dissolved in 10 c.c. of water. The solution was slightly

SOME SPECIMENS OF CLITOCYBE MULTICEPS PECK USED IN THE EXPERIMENTS

alkaline to litmus. Apparently there was no cholin in it, for there was no response to the Rosenheim test.

Experiment 13. October 24, 1910. Frog 15. Weight, 28 grams. Received an injection of 1 c.c. of the extract at 4.07 P.M.

4.17 P.M. Normal.

5.05 P.M. Normal.

October 25, 9.05 A.M. Normal.

Experiment 14. October 28, 1910. Frog 13a. Weight, 32 grams. At 2.28 P.M. received an injection of 1 c.c. of the extract administered to the frog in Experiment 13.

3.02 P.M. Normal.

3.25 P.M. Normal.

4.50 P.M. Normal.

Experiment 15. October 28, 1910. Frog 20. Weight, 35 grams. At 4.50 P.M. received, *per os,* 1 c.c. of the extract administered to the frog in Experiments 13 and 14.

5.05 P.M. Excited(?).

5.20 P.M. Normal.

5.50 P.M. Normal.

SUMMARY OF CONCLUSIONS

Inocybe infida, when subjected to processes of extraction and purification that separate muscarin from *Amanita muscaria,* yields material which exerts definite toxic effects upon frogs. These effects are quite different from those produced by muscarin as obtained, by the same method, from *Amanita muscaria.* A prolonged state of lethargy, often with complete recovery after twelve or fifteen hours in this condition, was a constant factor in our toxicological experiments with this *Inocybe.* The poison seems to be of the narcotic type recently found by Ford in *Inocybe infelix.*

The poison of *Inocybe infida* seems to belong chemically to the class of alkaloids or related substances. The plants of this species are small. A very much larger supply of these mushrooms than the available quantity will be required for the isolation and chemical identification of the toxic material.

Dr. William A. Murrill called Professor Gies' attention to the

SOME SPECIMENS OF CLITOCYBE MULTICEPS PECK USED IN THE EXPERIMENTS

case of poisoning in Dr. Deming's family (p. 178) and suggested the desirability of an inquiry into the cause. At Professor Gies' request we conducted these experiments. The sincere thanks of the writers are due to Professor Gies for his interest and suggestions. Dr. Murrill very kindly supplied us with the fungi used in this work, and to him also our thanks are due.

LABORATORY OF BIOLOGICAL CHEMISTRY OF COLUMBIA UNIVERSITY,
COLLEGE OF PHYSICIANS AND SURGEONS,
NEW YORK CITY.

THE AGARICACEAE OF TROPICAL NORTH AMERICA—III

WILLIAM A. MURRILL

The introductory remarks used in the last article of this series apply in a general way to the genera here treated; most of them belong to temperate regions and are scantily represented in the tropics except at high elevations. The genus *Hydrocybe* seems to delight in the moist mountain tops where tree-ferns grow, and a number of endemic species have been developed in these peculiar and segregated localities. It was my good fortune to be admirably situated at Cinchona, Jamaica, at 5,000 feet elevation, for the study of many species of this genus, and to have Mrs. Murrill with me to make colored drawings from the freshly gathered specimens.

The following simple key may be used to distinguish these genera. They all contain fleshy, central-stemmed species, but none of them possess a volva and only two are furnished with the rudiments of an annulus. The temperate species far exceed those of the tropics, both in number and abundance.

Lamellae fleshy, not waxy, though apparently so in *Laccaria*.	
Lamellae adnate; spores echinulate.	1. LACCARIA.
Lamellae decurrent.	
Sporophore solitary or gregarious.	2. CLITOCYBE.
Sporophore densely cespitose.	3. MONADELPHUS.
Lamellae sinuate or adnexed.	4. MELANOLEUCA.
Lamellae waxy at maturity, translucent or watery in appearance.	
Veil absent; pileus usually bright-colored.	5. HYDROCYBE.
Veil present; pileus not bright-colored.	6. HYGROPHORUS.

1. LACCARIA Berk. & Br. Ann. Nat. Hist. 370. 1883

Russuliopsis Schröt. Krypt. Fl. Schles. 3^1: 622. 1889.

This genus is distinguished from *Clitocybe* by its echinulate spores and adnate gills.

LACCARIA LACCATA (Scop.) Berk. & Br.
Ann. Nat. Hist. 370. 1883

Clitocybe laccata Quél. Champ. Jura Vosg. 55. 1872.

No attempt is here made to list the synonyms of this common and well-known temperate species, which is probably confined to the higher elevations of our tropics, being abundant at Cinchona, Jamaica.

Cinchona, Jamaica, *W. A. & Edna L. Murrill 547, 599;* Cuba, *Wright;* Jalapa, Mexico, *W. A. & Edna L. Murrill 2.*

2. CLITOCYBE (Fries) Quél. Champ. Jura Vosg. 48. 1872

The distinguishing feature of this very important temperate genus is its decurrent gills. Some of the species, however, do not show this character very conspicuously.

1. **Clitocybe niveicolor** sp. nov.

Entire sporophore snowy-white, gregarious in moist humus; pileus compressed-convex, reaching 7 mm. in diameter; surface smooth, glabrous, appearing subtomentose when dry because of the loosely woven context, margin slightly irregular, decurved; lamellae decurrent, distant, slightly arcuate; spores ovoid, smooth, hyaline, $12 \times 7\mu$; stipe cylindric, slightly tapering upward, glabrous, fleshy, fistulose, 1–1.5 cm. long, 1 mm. thick above, 1.5 mm. below.

Type collected on the ground in a moist virgin forest covering a mountain side near Motzorongo, Mexico, 1,000 ft. elevation, January 15, 1910, *W. A. & Edna L. Murrill 1058.*

3. **Clitocybe troyana** sp. nov.

Pileus subhemispheric, regular, solitary, 1 cm. broad; surface dry, smooth, glabrous, pale-isabelline; margin regular, concolorous, incurved on drying; lamellae decurrent, rather crowded, white; spores ovoid, smooth, hyaline, $5 \times 4\mu$; stipe straight, tapering upward, subconcolorous, glabrous, 2.5 cm. long, 1–1.5 mm. thick.

Type collected on the ground in woods, Troy and Tyre, Jamaica, January 12–14, 1909, *W. A. Murrill & W. Harris 931.*

4. **Clitocybe incrustata** sp. nov.

Pileus turbinate, with conic umbo, solitary, 2 cm. broad, nearly 1 cm. high; surface smooth, glabrous, dry, pallid with a rosy tint, light-bay on the umbo, becoming incrusted on drying with a white, powdery substance readily soluble in water; margin thin, straight, concolorous; lamellae decurrent, few in number, dull-white; spores ovoid, smooth, hyaline, 8–10 × 5–7 μ; stipe curved, cylindric, subequal, glabrous, white, 4 cm. long, 4 mm. thick.

Type collected in rich soil on a wet bank at Chester Vale, Jamaica, 3,000 ft. elevation, December 23, 1908, *W. A. & Edna L. Murrill 298*. The powdery substance covers about one third of the surface and is distributed in radiating patches or streaks.

5. **Clitocybe testaceoflava** sp. nov.

Pileus obconic in outline, deeply umbilicate, irregularly oval in cross section, solitary, 3–5 cm. broad; surface dry, distinctly tomentose, dilute-testaceous, margin irregularly undulate, incurved, concolorous; lamellae decurrent, rather distant, stramineous, edges undulate; spores ellipsoid, smooth, slightly yellowish, 4–5 × 3 μ; stipe cylindric, subequal, curved, slightly paler than the surface of the pileus, white near the base, 3–4 cm. long, 3 mm. thick.

Type collected under low bushes on a bank at Cinchona, Jamaica, 5,000 ft. elevation, December 25–January 8, 1908–9, *W. A. & Edna L. Murrill 543*.

6. **Clitocybe mexicana** sp. nov.

Pileus convex to depressed, irregularly lobed, gregarious, scarcely cespitose, 7 cm. broad; surface smooth, glabrous, nearly white, with an avellaneous-isabelline tint, margin striate, involute when young; context 1 cm. thick at the center, milk-white, sweet, odor none when fresh, but strong and not unpleasant on drying; lamellae decurrent, close, rather narrow, tapering at each end, pale watery-white; spores fusiform, smooth, hyaline, 7 μ long; stipe enlarging slightly above, dealbate, glabrous, finely tomentose near the base, hollow, white inside, with a tough rind, 7 cm. long, nearly 2 cm. thick.

Type collected on the ground among humus in a moist virgin forest near Jalapa, Mexico, 5,000 ft. elevation, December 12–20, 1909, *W. A. & Edna L. Murrill 137*.

7. Clitocybe Broadwayi sp. nov.

Gregarious to subcespitose, rather large, abundant, strongly suggesting *Tricholoma alboflavidum,* but with distinctly decurrent gills; pileus thin, convex, often indented on the side next to the stipe owing to its clustered arrangement, 5–8 cm. broad; surface glabrous, faintly radiate-striate, dry, white or pale-isabelline, depressed to umbilicate; margin incurved, concolorous, blackening when bruised; lamellae decurrent, close, narrow, white; spores ellipsoid, smooth, hyaline, 5–7 × 3.5–4.5 μ; stipe curved, cylindric, usually equal, glabrous, toughish, slightly reddish-brown, twisted and finely grooved when dry, suggesting asbestos, 5–7 cm. long, 2–4 mm. thick.

Type collected on the ground among leaves in a cocoa plantation at Tanteen, St. George's, Grenada, August 23, 1905, *W. E. Broadway.* Also collected in Grenada by Broadway in September, 1905.

DOUBTFUL AND EXCLUDED SPECIES

Most of these will be found treated under *Monadelphus, Omphalia,* and *Marasmius. Clitocybe rivulosa,* reported from the West Indies by Fries, is a European plant, and no specimens of it from tropical America have been seen in any of the herbaria examined. *Clitocybe pachylus* Berk. & Curt., from Cuba, is probably undescribed.

3. MONADELPHUS Earle, Bull. N. Y. Bot. Garden **5**: 432. 1909

This genus was founded by Earle to receive the cespitose species of *Clitocybe,* the type being *C. illudens.*

Monadelphus caespitosus (Berk.)

Lentinus caespitosus Berk. Hook. Lond. Jour. Bot. **6**: 317. 1847. (Type from Ohio.)

Agaricus (Pleurotus) caespitosus Berk. Jour. Linn. Soc. **10**: 287. 1868.

Agaricus monadelphus Morgan, Jour. Cinc. Soc. Nat. Hist. **6**: 69. 1883. (Type from Ohio.)

Clitocybe monadelpha Sacc. Syll. Fung. **5**: 164. 1887.

Pleurotus caespitosus Sacc. Syll. Fung. **5**: 352. 1887.

A rather common species in the southern United States, ranging north to New York and west to Kansas. At Kew, it is represented by specimens from South Carolina and Ohio only, those from Cuba bearing this name being an entirely different plant. Fries knew the species well, so we may infer that Liebmann's specimens from Orizaba, Mexico, were correctly determined, although they appear to have been lost. This species has the habit and general form, but neither the brilliant coloring nor the poisonous properties, of *M. illudens.* It is difficult to distinguish from certain forms of *Armillaria mellea,* which also occurs in dense clusters about old stumps but is usually furnished with a veil. The spores of *M. caespitosus* are broadly ovoid, smooth, hyaline, $7 \times 5\,\mu$.

Orizaba, Mexico, *Liebmann;* British Honduras, *Morton E. Peck.*

4. MELANOLEUCA Pat. Tax. Hymén. 159. 1900

Tricholoma (Fries) Quél. 1872. Not *Tricholoma* Benth. 1820.

This genus, usually known as *Tricholoma,* is abundantly represented in temperate regions. It differs from *Clitocybe* chiefly in its sinuate or adnexed, instead of decurrent, gills.

1. **Melanoleuca holoporphyra** (Berk. & Curt.)

Agaricus (*Clitocybe*) *holoporphyrus* Berk. & Curt. Jour. Linn. Soc. **10**: 284. 1868.

Described from Wright's Cuban collections, and said to grow on rotten logs in woods. The types at Kew have been examined. My own notes, supplemented by a colored drawing, are as follows: "Pileus convex, 6 cm. broad; surface latericious, dry, finely tomentose, slightly striate on the margin; lamellae sinuate with a decurrent tooth, broad, distant, testaceous; spores ovoid, smooth, hyaline, $9\text{–}12 \times 4\text{–}7\,\mu$; stipe equal, pale-purple, glabrous, hollow, with a fibrous-looking rind, 6×1 cm. Solitary in rich soil in coffee plantations along the Rio Blanco, January 17, 1910."

Xuchiles, Mexico, *W. A. & Edna L. Murrill 1125.*

2. **Melanoleuca dichropus** (Fries)

Agaricus (*Tricholoma*) *dichropus* Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 22. 1851.

This beautiful species was collected in the island of St. Thomas by Oersted, who made a colored drawing of it which may still be seen at Copenhagen, but no trace of the fungus itself was discovered either in Denmark or in Sweden. The pileus is represented as dilute wine-colored, with a purple center, and the stipe is concolorous except at the apex, where it abruptly changes to white. The general form of the plant is more like *Lepiota* than *Melanoleuca.*

3. **Melanoleuca jamaicensis** sp. nov.

Pileus umbilicate, solitary, 2–3 cm. broad; surface glabrous, latericious-fulvous; lamellae sinuate with a decurrent tooth, latericious, broad, rather distant; spores globose, smooth, hyaline, 3–4μ; stipe slender, cylindric, equal, glabrous, concolorous with the surface of the pileus, 4 cm. long, 2.5 mm. thick, the apex much enlarged, 5 mm. thick, stramineous, and tomentose.

Type collected on the ground under tree-ferns at Morce's Gap, Jamaica, 5,000 ft. elevation, December 29, 30, January 2, 1908–9, *W. A. & Edna L. Murrill 72c.* The fresh plant has the appearance of *Clitocybe proxima* Boud.

4. **Melanoleuca subisabellina** sp. nov.

Pileus irregular, convex to infundibuliform, gregarious, 4–8 cm. broad; surface glabrous, dull-colored, dingy-isabelline, margin undulate or slightly lobed, inflexed; lamellae sinuate, straight, narrow, rather close, white to dirty-brownish; spores ellipsoid, hyaline, 5 × 3.5 μ, with minute, short prickles; stipe curved, tapering toward the base, glabrous, fleshy, white, 3 cm. long, 3–10 mm. thick.

Type collected on a waste heap of earth and vegetable refuse in Castleton Gardens, Jamaica, December 14, 15, 1908, *W. A. & Edna L. Murrill 45.*

5. **Melanoleuca jalapensis** sp. nov.

Pileus convex, much split at the margin, solitary, 4 cm. broad; surface dry, glabrous, shining, more or less radiate-rimose, the castaneous cuticle remaining entire at the center, but almost disappearing near the margin, where it persists in faint streaks or patches; context thin, white, sweet; lamellae adnate with a slight sinus, narrow, rather close, cremeous, pruinose under a lens; spores globose, smooth, hyaline, 5μ; stipe cylindric, equal, gla-

brous, white, with a tough rind, 4 cm. long, 7 mm. thick, abruptly bulbous at the base as in some species of *Clitocybe* and *Cortinarius*.

Type collected on rich soil in a moist virgin forest near Jalapa, Mexico, December 12–20, 1909, *W. A. & Edna L. Murrill 85*.

DOUBTFUL SPECIES

Agaricus (*Tricholoma*) *sordidus* Fries, Epicr. Myc. 53. 1838. Reported from St. Thomas by Fries in Nova Acta Soc. Sci. Upsal. III. 1: 23. 1851, who identified one of Oersted's collections as this species. No trace of the specimens in question were found in Europe.

5. **Hydrocybe** (Fries) Karst. Hattsv. 233. 1879

This genus, usually known as *Hygrophorus*, contains many brilliantly colored members in temperate regions, some of the commonest of which were described and illustrated in MYCOLOGIA for July, 1910.

1. **Hydrocybe albo-umbonata** sp. nov.

Pileus conic, with long cylindric umbo, solitary, 2.5 cm. broad, nearly 2 cm. high; surface smooth, glabrous, moist, white; lamellae broad, ventricose, thin, white; spores subglobose, smooth, hyaline, 5–7 μ; stipe curved, terete, equal, glabrous, moist, white, 5 cm. long, 2 mm. thick.

Type collected on the ground in woods at New Haven Gap, Jamaica, 5,600 ft. elevation, January 4, 1909, *W. A. & Edna L. Murrill 764*.

2. **Hydrocybe aurantia** sp. nov.

Pileus obconic, small, solitary, 1.5 cm. broad; surface smooth or slightly striate, glabrous, dry or moist, aurantiacous, lamellae adnate, rather broad and distant, subconcolorous; spores globose, smooth, hyaline, 3–5 μ; stipe slightly tapering downward, glabrous, aurantiacous, pruinose at the apex, 2.5 cm. long, about 2 mm. thick.

Type collected on the ground in woods at Morce's Gap, Jamaica, 5,000 ft. elevation, December 29, 30, January 2, 1908–9, *W. A. & Edna L. Murrill 743*.

3. **Hydrocybe bella** (Massee)

Hygrophorus bellus Massee, Jour. Bot. **30**: 161. 1892.

Type collected on the ground in woods in the Nariaqua Valley, St. Vincent, by W. R. Elliott. A large scarlet species with decurrent gills and immense ellipsoid spores 18 × 10 μ.

4. **Hydrocybe Cantharellus** (Schw.)

Agaricus (*Omphalia*) *Cantharellus* Schw. Schr. Nat. Ges. Leipzig, **1**: 88. 1822.

Hygrophorus Cantharellus Fries, Epicr. Myc. 329. 1838.

A very pretty little species, resembling *Omphalia* but brilliantly colored, common in many varieties from Maine to Alabama and west to Minnesota. The spores of the tropical specimens are ellipsoid, smooth, hyaline, 8–9 × 5 μ.

Castleton Gardens, Jamaica, *Earle 227;* New Haven Gap, Jamaica, 5,600 ft. elevation, *W. A. & Edna L. Murrill 760.*

5. **Hydrocybe Earlei** sp. nov.

Pileus convex, solitary, 3 cm. broad; surface glabrous, silky-shining, not striate, pale reddish-yellow; context yellow, mild; lamellae slightly adnexed, crowded, broad, ventricose, cremeous; spores globose, smooth, hyaline, 7 μ; stipe somewhat flattened, equal, hollow, glabrous, shining, pale-yellow, 5–6 cm. long, 4–6 mm. thick.

Type collected on the ground in a pasture at Herradura, Cuba, June 16, 1907, *F. S. Earle 562.*

6. **Hydrocybe flavolutea** sp. nov.

Pileus convex, solitary, 1.3 cm. broad, 5 mm. high; surface luteous, with faint traces of red, polished, slightly viscid, radiate-striate; lamellae flavous, slightly ventricose, rather close, several times inserted, apparently free, but really connected by slender threads of tissue across the disk to which the stipe is attached; spores globose, regular, hyaline, uninucleate, smooth, 4–5 μ; stipe cylindric, equal, smooth, glabrous, citrinous, whitish-tomentose and slightly enlarged at the base, 2.2 cm. long, 1.5 mm. thick.

Type collected in soil on a bank at Cinchona, Jamaica, December 25–January 8, 1908–9, *W. A. & Edna L. Murrill 527.* Also collected at Jalapa, Mexico, December 12–20, 1909, *W. A. & Edna L. Murrill 35, 110.*

7. **Hydrocybe hondurensis** sp. nov.

Pileus convex to plane, slightly depressed, solitary, 1–1.5 cm. broad; surface luteous, very viscid, radiate-striate; lamellae short-decurrent, rather narrow, inserted; spores ovoid, smooth, hyaline, $5 \times 3.5 \mu$; stipe equal, concolorous, very viscid, 3–4 cm. long, 1–2 mm. thick.

Type collected in rich soil in British Honduras, 1906, *Morton E. Peck.*

8. **Hydrocybe rosea** sp. nov.

Pileus convex with an umbilicate center, resembling *Omphalia* in shape, solitary, 1 cm. broad, 5 mm. high; surface smooth, glabrous, not viscid, roseous to incarnate, margin entire or rarely lobed, decurved; context very thin, allowing the lamellae to show through on the upper side; lamellae decurrent, arcuate, white, stained with red; spores ovoid, smooth, hyaline, $10–13 \times 7–9 \mu$; stipe smooth, cylindric, paler than the pileus below, deep-red at the apex, where it is much enlarged, 1.5 cm. long, 1 mm. thick below.

Type collected in moss on a decayed log on Sir John Peak, Jamaica, 6,000 ft. elevation, January 5, 1909, *W. A. Murrill 811.*

9. **Hydrocybe subcaespitosa** sp. nov.

Pileus convex to plane or depressed, subcespitose, 2–3 cm. broad; surface smooth, glabrous, ruber when young, miniatous when older; lamellae white to stramineous, adnate or slightly decurrent, broad, inserted; spores oblong-ellipsoid, smooth, hyaline, $8–9 \times 5 \mu$; stipe thick, cylindric to slightly flattened, smooth, glabrous, luteous or paler yellowish, about 3 cm. long, 5 mm. or more thick.

Type collected on rich soil under tree-ferns at Morce's Gap, Jamaica, 5,000 ft. elevation, December 29, 30, January 2, 1908–9, *W. A. & Edna L. Murrill 750.*

10. **Hydrocybe subflavida** sp. nov.

Pileus conic to subcampanulate, umbonate, gregarious, reaching 5 cm. broad and 3 cm. high; surface pale-flavous, dull-luteous in very young stages and on the umbo, moist, smooth, becoming striate in old or wet specimens; lamellae adnate with decurrent tooth, broad, ventricose, rather distant, pale-yellow; spores globose, smooth, hyaline, 5μ; stipe cylindric, equal, pale-flavous, glabrous, 4–5 cm. long, 4–7 mm. thick.

Type collected on the ground under tree-ferns at Morce's Gap, Jamaica, 5,000 ft. elevation, December 29, 30, January 2, 1908–9, *W. A. & Edna L. Murrill 674.*

11. **Hydrocybe subminiata** sp. nov.

Pileus convex to plane, at length irregular, 1.5 cm. broad; surface viscid, smooth, miniatous, varying slightly in places, margin undulate; lamellae decurrent, few, whitish to ochraceous; spores oblong-ellipsoid, often constricted at the middle, smooth, hyaline, about $9 \times 5\,\mu$; stipe terete, crooked, slightly enlarged above, glabrous, luteous, 3 cm. long, 2 mm. thick.

Type collected in soil on a shaded bank at Chester Vale, Jamaica, 3,000 ft. elevation, December 23, 1908, *W. A. & Edna L. Murrill 369.* Also collected on the ground under tree-ferns at Morce's Gap, Jamaica, December 29, 30, January 2, 1908–9, *W. A. & Edna L. Murrill 672.* What appears to be the same species was collected near Santiago de las Vegas, Cuba, September 11, 1904, *F. S. Earle 181.*

12. **Hydrocybe troyana** sp. nov.

Pileus subhemispheric to convex, solitary, 1–1.5 cm. broad, 3 mm. high; surface smooth, viscid when wet, ferruginous; lamellae decurrent, violaceous, distant, rather broad, two or three times inserted; spores ellipsoid, smooth, hyaline, $7–9 \times 4–5\,\mu$; stipe glabrous, cylindric, latericious above, paler below, changing to flavous at the base, 4 cm. long, 2.5 mm. thick.

Collected on the ground in Troy and Tyre, Jamaica, January 12–14, 1909, *W. A. Murrill & W. Harris 1078 (type), 1090.* This is a smaller species than *H. coccineus,* with ferruginous hues on the surface of the pileus and violet-tinted lamellae.

DOUBTFUL SPECIES

Hygrophorus miniatus Fries, Epicr. Myc. 330. 1838. This common temperate species has been reported by Duss upon various kinds of dead wood in Guadeloupe.

Hygrophorus? variolosus Fries, Nova Acta Soc. Sci. Upsal. III. 1: 29. 1851. Described from collections in Costa Rica by Oersted, who made colored drawings of fresh specimens and also preserved some in alcohol. These specimens could not be found

in Europe, but the drawings strongly suggest *Chamaemyces alphitophyllus*.

6. HYGROPHORUS Fries, Gen. Hymen. 8. 1836

Lymacium (Fries) Schröt, Krypt. Fl. Schles. 3^1: 330. 1889.

This genus in its present limitation includes species provided with a veil, which is glutinous and often inconspicuous.

1. **Hygrophorus subpratensis** sp. nov.

Pileus convex, obtuse, gregarious, 3–4 cm. broad; surface pale-fuscous when young, becoming pallid or whitish with darker disk, slimy-viscid, not striate, pellicle separable; context white, unchanging, odor and taste mild; lamellae deeply sinuate, broad, crowded, white; spores globose or subglobose, smooth, hyaline, 5 μ; stipe cylindric, equal, slimy-viscid, white, solid but spongy, 3–4 cm. long, 3–4 mm. thick; veil slimy-viscid, scarcely leaving an annulus.

Type collected on lawns at Santiago de las Vegas, Cuba, June 1, 1905, *F. S. Earle 373*. Also collected on banana trash in the some locality, June 16, 1904, *F. S. Earle 68*.

2. **Hygrophorus montanus** sp. nov.

Pileus plane or convex, smooth, depressed, gregarious, 2.5 cm. broad; surface smooth, viscid, stramineous to isabelline, with a testaceous tint, margin incurved, white, entire; lamellae adnexed, rather broad, yellowish-white, discolored in blotches on drying, pruinose on the edge; spores pip-shaped, smooth, faintly yellowish, 8–10 $\times$ 4–5 μ; stipe shining, watery-white, smooth, cylindric, equal, fleshy-fibrous, 4 cm. long, 5 mm. thick; veil very slight, not forming an annulus.

Type collected on the ground in a trail at New Haven Gap, Jamaica, 5,600 ft. elevation, January 4, 1909, *W. A. & Edna L. Murrill 769*.

NEW YORK BOTANICAL GARDEN.

NOTE ON THE REPUTED POISONOUS PROPERTIES OF COPRINUS COMATUS

Louis C. C. Krieger

In Mycologia for March, 1911, Professor Dearness alludes to some recent cases of poisoning attributed by Doctor Cleghorn to *Coprinus comatus*. As this species is a favorite with mushroom-eaters, any reflection upon its character is worthy of consideration. Professor Dearness, realizing this, suggests the following explanation:

"In the process of disintegration, nocuous products undoubtedly do develop from innocent compounds, but, further, it is quite conceivable that the strength of poisonous principles may vary in the same species of mushroom or that even some alkaloid may be normally present in one set of conditions and be absent in another. On what other theory can one explain the experience reported by Dr. Cleghorn in the October number of *Good Housekeeping* (p. 442)?"

Could not a poisonous species somehow have got into the broth?

Four reasons present themselves against the view that the noted edible *Coprinus* could have caused the trouble. (1) Some mycophagists claim that deliquescence, instead of rendering it poisonous, heightens the flavor. (2) It is not apt to be eaten in the decaying condition, for it becomes repulsive to the average person by its deliquescence alone: no person with his olfactories in normal order will eat the decayed or decaying plant. (3) Except by mistake it has never before been reported as poisonous.* (4) Idiosyncrasy, in Dr. Cleghorn's cases, is out of the question, as too many individuals were similarly affected.

But if another species may be held responsible, then which?

* According to J. A. Palmer ("About Mushrooms," Boston, 1894, p. 11), Berkeley and Curtis are said to have considered it poisonous, but Berkeley ("Outlines") states it to be edible, and Curtis ("Catalogue of N. Carolina Fungi") does likewise. Indeed, its reputation as an edible fungus may be traced back to Pliny.

Coprinus comatus is not the only lawn-inhabiting agaric. There are many others, among them one with a reputation for producing just such symptoms as those described by Dr. Cleghorn. Its name is *Panaeolus campanulatus.* It is quite possible that specimens of this species were gathered and eaten along with the Shaggy Mane.

Let us compare the symptoms of Dr. Cleghorn's cases with those of a case† reported to have been caused by the *Panaeolus.* Dr. Cleghorn's account, summarized, reads as follows:

The plants eaten by the patients were found growing on a lawn. Specimens gathered there on a previous occasion had been enjoyed without deleterious effects. The last time, however, ten persons in four different families were affected as if by a poison. The effects were produced "even while the dish of stewed mushrooms was still being passed." A few individuals showed the effects later—after several hours. The symptoms were not unlike those of alcohol-intoxication. The Doctor records failure of muscular coördination, difficulty in standing, inability to walk, drowsiness, lack of control of the emotions, bloodshot eyes, enlarged pupils, and incoherent or at least inappropriate speech. Prostration was absent. Action of heart and lungs strong and regular. The vision of one patient was affected in such a way that the furniture seemed bent, pliable, and in motion. Another had a temporary, but complete, paralysis of the left arm.

In Dr. Glen's case of *Panaeolus*-poisoning, we learn that his patient, a poor man of Knightsbridge, England, collected one morning some fungi which he cooked and ate for breakfast. Eight or ten minutes after the commencement of the meal he was "suddenly seized with dimness or mist before his eyes, lightness and giddiness of his head, with a general trembling and sudden loss of power,—so much so, that he nearly fell off the chair; to this succeeded loss of recollection; he forgot where he was, and all the circumstances of his case. This temporary deprivation soon went off, and he so far rallied as to be able, though with difficulty, to get up, with the intention of coming here for assistance, a distance of about five hundred yards: he had not proceeded

† Glen, G., "A Case proving the Deleterious Effects of the *Agaricus Campanulatus,* which was mistaken for the *Agaricus Campestris,* or Champignon." London Med. & Phys. Jour. **36**: 451–453. 1816.

more than half way when his memory again failed him: he lost the road, although previously perfectly acquainted with it, but was fortunately met by a friend, who with difficulty learned his state and brought him to me. . . . His countenance betrayed great anxiety; he could scarcely stand, but reeled about somewhat like a drunken man; he spoke with hesitation and reluctance; he complained of no pain except some transient twitches in his legs; he had no nausea; he suffered much from giddiness, and was greatly inclined to sleep; his pulse was slow and feeble. . . . Distressing pains in the calves of his legs," and weakness and languor the next day were also noted. An emetic was given, after which the man rapidly recovered.

Specimens of the plant responsible for this case were seen by Dr. Glen and his teacher, William Salisbury, and identified as *Agaricus campanulatus* L. (=*Panaeolus campanulatus* [L.] Fr.). Glen refers to a similar case reported by Salisbury in *The Gentleman's Magazine* for September, 1815. This reference was not looked up.

Panaeolus campanulatus, it is true, is somewhat difficult to determine, because of its great variability and its many close relatives; nevertheless, it cannot be doubted that Glen had to do with a *Panaeolus* and not with a *Coprinus,* and that is sufficient for our purposes. That the active poisonous principle was the same in both cases seems equally certain, if we may judge from symptoms; and the statements in paragraph four of this note may also be safely adduced in our attempt to clear *Coprinus comatus* of the imputation of being poisonous. Experiments with these common plants ought to settle the question beyond peradventure.

CAMBRIDGE, MASS.

NEWS AND NOTES

Dr. Robert A. Harper, professor of botany in the University of Wisconsin, has accepted the Torrey professorship of botany in Columbia University.

Professor F. E. Clements, of the University of Minnesota, accompanied by Mrs. Clements, visited the Garden on June 13 on his way to Europe.

William Russell Dudley, professor emeritus of botany at Stanford University, California, died on June 4, aged sixty-two years. Professor Dudley was called to Stanford from Cornell in 1893.

Dr. C. H. Shattuck, of the department of forestry of the University of Idaho, is planning a survey of the Kaniksu National Forest during the present summer.

In *Rhodora* **13**: 57–66. 1911, Mr. Simon Davis gives some critical and interesting notes on certain rare and little-known species of fleshy fungi collected by him in 1910 in the vicinity of Stow, Massachusetts.

Dr. L. H. Pennington, assistant professor of botany in Syracuse University, spent two days at the Garden in June examining the collections of *Coprinus*.

Dr. C. H. Kauffmann has been promoted from instructor to assistant professor of botany at the University of Michigan.

Observations and notes are desired on aborted or sterile forms of the sporophores of the higher fungi.

The relation of *Ozonium* to *Coprinus* is discussed by Lutz in Bull Soc. Myc. France **27**: 110–113. 1911.

Bresadola gives a critical list with notes of 79 species of Congo fungi in *Annales Mycologici* for June, 1911.

R. J. Pool has begun an illustrated series of papers on the forest fungi of Nebraska in the *Forest Club Annual.*

In the *Transactions of the British Mycological Society* (3: 179–185. 1910), A. D. Cotton continues his notes on the Clavariae of Great Britain.

An interesting contribution to our knowledge of mine fungi, by P. Spaulding, appears in the annual report of the Missouri Botanical Garden for 1910.

Monographs of the principal European species of *Hygrophorus* and *Inocybe,* by Bataille, have appeared in the memoirs of the *Societé d'Emulation du Doubs.*

Sphaeropsis tumefaciens, the cause of the lime and orange knot, was described and figured by Florence Hedges in the April number of *Phytopathology.*

Bruce Fink, in the *Ohio Naturalist* for January, lists twenty-eight species of Boletaceae collected by him during the summer of 1909 near Oxford, Ohio, and Berea, Kentucky.

The known Polyporaceae of Ohio, numbering 118 species, are listed by L. O. Overholts in the *Ohio Naturalist* for June, with descriptive notes and helpful suggestions to students and collectors.

Dr. G. P. Clinton is to be congratulated upon his discovery of the oospores of *Phytophthora infestans,* structures long sought by mycologists and declared by some to be mythical.

The various forms of crown-gall in plants have received much attention of late at the Bureau of Plant Industry in Washington. Students are referred to bulletins 183, 186, and 213 of that bureau for the results of the principal investigations.

In *Phytopathology* for June, P. Spaulding gives an account of the rusts occurring on the hemlock spruce; and also reviews three important papers by Dr. Ernst Münch, of Munich, on the relations of certain forest fungi to their hosts, including approved methods of inoculation.

The first number of the *Pomona College Journal of Economic Botany,* published quarterly by the department of biology of Pomona College, at Claremont, California, contains an article by E. O. Essig on the wither-tip disease of citrus trees caused by a species of *Colletotrichum.*

F. Theiszen has recently published through the Royal Academy of Science at Vienna a handsomely illustrated pamphlet of 38 pages on the known Polyporaceae of southern Brazil, with interesting notes and citations. The list of 146 species contains a provisional new one, *Polyporus recurvatus,* described by the author, and *Poria bicolor,* described as new by Bresadola.

The toxicity of tannin is treated rather comprehensively by Cook and Taubenhaus in a recent bulletin of the Delaware College Experiment Station. This investigation has an important bearing on problems connected with immunity from diseases caused by fungi. In this connection, it is interesting to note that the chestnut canker has selected for its own particular use a tree containing an unusually large percentage of tannin.

Pyropolyporus Calkinsii, a large ungulate species found on living trunks of live-oak in southern Florida, was collected May 5, 1911, by Dr. H. D. House on a living trunk of *Quercus nigra* at Lake Catherine, Onslow County, eastern North Carolina. The species doubtless causes heart-rot, after the manner of *P. igniarius,* hence this extension of range and the discovery of a new host is of value to the forest pathologist.

Fungi on Mosses.—Cladosporium epibryum Cooke & Massee was referred to in the Bryologist for May and originally described without indication of hosts. As they were all sent to Dr. Massee, I wrote to inquire about them and received the following list of mosses as host species:

1. *Ulota phyllantha* Brid.—Jaquina Bay, Ore.—T. Howell.
2. *Fabronia andina* Mitt.—Ingenio del Oro, Bolivia—H. H. Rusby.
3. *Hypnum megaptilum* Sull.—Lake Pend d'Oreille, Idaho—J. B. Leiberg.
4. *Bartramia Potosica* Mont.—Sorata, Bolivia—H. H. Rusby.
5. *Grimmia ovata* W. & M.—Canada—J. Macoun, no. 84.
6. *Grimmia Doniana* Sm.—Spokane Falls, Wash.—J. B. Leiberg, No. 110.
7. *Encalypta rhabdocarpa* Schwgr.—Lake Pend d'Oreille—J. B. Leiberg, No. 153 in publication.
8. *Bartramia pomiformis* Hedw.—Lake Pend d'Oreille—J. B. Leiberg, No. 153 in publication.

These types are at Kew and duplicates of them are at the New York Botanical Garden. The fungus occurs as black septate filaments protruding from the walls of old capsules, particularly those that have wintered over, usually species of genera that hold their capsules a long time. In the case of *Ulota phyllantha,* they occurred around the mouth of the capsule, and the teeth were so much distorted and undeveloped that it was difficult to describe the peristome in these, the first specimens of this moss to be found fruiting.—*E. G. Britton.*